

## 1.1

### Building Functions from Functions

Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

Find an algebraic expression for  $h(x)$  by using the given functions for  $f(x)$  and  $g(x)$ . Give the domain of each. Show work!

1.  $f(x) = 2x + 1$ ;  $g(x) = -x^2$

a)  $h(x) = (f + g)(x)$

b)  $h(x) = (f - g)(x)$

c)  $h(x) = (fg)(x)$

d)  $h(x) = \left(\frac{f}{g}\right)(x)$

e)  $h(x) = \left(\frac{g}{f}\right)(x)$

2.  $f(x) = \sqrt{2x}$ ;  $g(x) = \cos x$

a)  $h(x) = (f + g)(x)$

b)  $h(x) = (f - g)(x)$

c)  $h(x) = (fg)(x)$

d)  $h(x) = \left(\frac{f}{g}\right)(x)$

e)  $h(x) = \left(\frac{g}{f}\right)(x)$

$$3. \quad f(x) = x^2 - 2x - 3; \quad g(x) = x - 1$$

$$a) \quad h(x) = (f + g)(x)$$

$$b) \quad h(x) = (f - g)(x)$$

$$c) \quad h(x) = (fg)(x)$$

$$d) \quad h(x) = \left( \frac{f}{g} \right)(x)$$

$$e) \quad h(x) = \left( \frac{g}{f} \right)(x)$$

$$4. \quad f(x) = \sqrt[3]{x-2}; \quad g(x) = \sin 2x$$

$$a) \quad h(x) = (f + g)(x)$$

$$b) \quad h(x) = (f - g)(x)$$

$$c) \quad h(x) = (fg)(x)$$

$$d) \quad h(x) = \left( \frac{f}{g} \right)(x)$$

$$e) \quad h(x) = \left( \frac{g}{f} \right)(x)$$

**Evaluate each of the following using the given functions. Show work!**

$$f(x) = 2x - 1 \qquad g(x) = \sqrt{x+5} \qquad h(x) = \frac{x}{x-3}$$

$$5. \quad f(1) - g(4)$$

$$6. \quad h(2) + g(-1)$$

$$7. \quad 2f(-3) - f(5)$$

$$8. \quad g(20) - 3f(2)$$

$$9. \quad \frac{f(1)}{g(-1)}$$

$$10. \quad g(4) \cdot h(6)$$

Find the indicated composition function and its domain, using the given functions. Show work!

11.  $f(x) = 3x + 2$                        $g(x) = x - 1$

a)  $h(x) = (f \circ g)(x)$

b)  $h(x) = (g \circ f)(x)$

c)  $h(x) = (f \circ f)(x)$

d)  $h(x) = (g \circ g)(x)$

12.  $f(x) = x^2 - 1$                        $g(x) = \frac{1}{x-1}$

a)  $h(x) = (f \circ g)(x)$

b)  $h(x) = (g \circ f)(x)$

c)  $h(x) = (f \circ f)(x)$

d)  $h(x) = (g \circ g)(x)$

13.  $f(x) = \frac{1}{x-1}$                        $g(x) = \sqrt{x}$

a)  $h(x) = (f \circ g)(x)$

b)  $h(x) = (g \circ f)(x)$

c)  $h(x) = (f \circ f)(x)$

d)  $h(x) = (g \circ g)(x)$

14.  $f(x) = |x - 5| - 2$                        $g(x) = -2 \sin x$

a)  $h(x) = (f \circ g)(x)$

b)  $h(x) = (g \circ f)(x)$

c)  $h(x) = (f \circ f)(x)$

d)  $h(x) = (g \circ g)(x)$

Evaluate each composition function using the given functions.

$$f(x) = 3x^2 - 1 \quad g(x) = \sqrt{x-1} \quad h(x) = \frac{x-2}{x-3}$$

15.  $(f \circ g)(1)$

16.  $(g \circ f)(5)$

17.  $(h \circ f)(4)$

18.  $(g \circ g)(26)$

19.  $(f \circ f)(-1)$

20.  $(h \circ h)(4)$

21. A high-altitude spherical weather balloon expands as it rises due to the drop in atmospheric pressure. Suppose the radius  $r$  increases at the rate of 0.03 inches per second and that  $r = 48$  inches at time  $t = 0$ . (Volume of a sphere:  $V(r) = \frac{4}{3}\pi r^3$ )

a) Determine an equation that models the volume  $V$  of the balloon at time  $t$ . (Hint: Find  $r$  in terms of time and write a composition function  $V(r(t))$ .)

b) Find the volume at  $t = 300$  seconds.